



DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2023-0670; Project Identifier AD-2022-01427-T; Amendment 39-22463; AD 2023-12-05]

RIN 2120-AA64

Airworthiness Directives; The Boeing Company Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: The FAA is superseding Airworthiness Directive (AD) 2022-03-05, which applied to all The Boeing Company Model 747-8F and 747-8 series airplanes and Model 777 airplanes. AD 2022-03-05 required revising the limitations section of the existing airplane flight manual (AFM) to incorporate limitations prohibiting dispatching or releasing to airports, and approaches or landings on runways, when in the presence of interference from wireless broadband operations in the 3.7-3.98 GHz frequency band (5G C-Band) as identified by Notices to Air Missions (NOTAMs). Since the FAA issued AD 2022-03-05, the FAA determined that additional limitations are needed due to the continued deployment of new 5G C-Band stations whose signals are expected to cover most of the contiguous United States at transmission frequencies between 3.7-3.98 GHz. This AD requires revising the limitations section of the existing AFM to incorporate limitations prohibiting dispatching or releasing to airports, and approaches or landings on runways, due to the presence of 5G C-Band interference. The FAA is issuing this AD to address the unsafe condition on these products.

DATES: This AD is effective [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES:

AD Docket: You may examine the AD docket at [regulations.gov](https://www.regulations.gov) under Docket No. FAA-2023-0670; or in person at Docket Operations between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this final rule, any comments received, and other information. The address for Docket Operations is U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.

FOR FURTHER INFORMATION CONTACT: Brett Portwood, Continued Operational Safety Technical Advisor, COS Program Management Section, Operational Safety Branch, FAA, 3960 Paramount Boulevard, Lakewood, CA 90712-4137; phone: 817-222-5390; email: operationalsafety@faa.gov.

SUPPLEMENTARY INFORMATION:**Background**

The FAA issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 to supersede AD 2022-03-05, Amendment 39-21922 (87 FR 4150, January 27, 2022) (AD 2022-03-05). AD 2022-03-05 applied to all The Boeing Company (Boeing) Model 747-8F and 747-8 series airplanes and Model 777 airplanes equipped with a radio altimeter. The NPRM published in the *Federal Register* on May 3, 2023 (88 FR 27799). The NPRM was prompted by a determination that radio altimeters cannot be relied upon to perform their intended function if they experience interference from wireless broadband operations in the 5G C-Band, and a determination that this interference may affect other airplane systems using radio altimeter data, including the pitch control laws, including those that provide tail strike protection, regardless of the approach type or weather.

In the NPRM, the FAA proposed to retain the AFM revisions required by AD 2022-03-05 until June 30, 2023. On or before June 30, 2023, the FAA proposed to

require replacing those AFM revisions with limitations prohibiting dispatching or releasing to airports, and approaches or landings on runways, in the contiguous U.S. airspace for non-radio altimeter tolerant airplanes. For radio altimeter tolerant airplanes, the FAA proposed to allow the prohibited operations at 5G C-Band mitigated airports (5G CMAs) as identified in an FAA Domestic Notice. The FAA proposed this AD to address missing or erroneous radio altimeter data, which, in combination with multiple flight deck effects, could lead to loss of continued safe flight and landing.

Discussion of Final Airworthiness Directive

Comments

The FAA provided the public with an opportunity to comment on the proposed AD and received comments from five commenters. The following presents the comments received on the NPRM and the FAA's response to each comment.

Support for NPRM

Boeing and the Air Line Pilots Association, International (ALPA), supported the NPRM without change.

The supportive comments from ALPA included additional viewpoints without a suggestion specific to the AD or a request the FAA can act on. These comments are outside the scope of this AD.

Request for Additional AMOC Relief

Comment summary: All Nippon Airways (All Nippon) requested the FAA revise the proposed AD to allow AMOCs approved for AD 2023-10-02, Amendment 39-22438 (88 FR 34065, May 26, 2023) (AD 2023-10-02) as AMOCs for this AD.

FAA response: The FAA does not agree. An airplane that is a radio altimeter tolerant airplane for purposes of AD 2023-10-02 will also be a radio altimeter tolerant airplane for purposes of this AD. However, because the hazards mitigated by AD 2023-10-02 are separate and distinct from the hazards mitigated by this AD, the FAA has

determined that AMOCs approved for compliance with AD 2023-10-02 may not always be appropriate to address the unsafe condition specified in this AD. For this reason, operators with an approved AMOC for AD 2023-10-02 will need to request approval of it as an AMOC for compliance with this AD.

Request to Extend Compliance time

Comment summary: American Airlines expressed concern regarding the compliance time for the proposed actions and requested the FAA revise the AD to provide a minimum of 30 days from the effective date of the AD.

FAA response: The FAA understands the commenter's concern and made every effort to publish this AD as soon as possible. After refraining from operating at their FCC-authorized levels for a year and a half, wireless companies are now able to operate at higher levels, yet still not at the levels authorized. Specifically, wireless companies expect to operate their networks in urban areas with minimal restrictions due to the completion of retrofits. Additionally, the FAA anticipates 19 additional telecommunication companies will begin transmitting in the C-Band after June 30, 2023. Although the FAA continues to work with the companies that intend to transmit in the 3.7-3.98-GHz band near 5G CMAs, the FAA has no agreement with those companies to provide the FAA with tower locations and other information necessary to support the current NOTAM/AMOC process. Therefore, the FAA will not be able to extend the June 30, 2023, date.

Request for List of Compliant Radio Altimeters

Comment summary: All Nippon requested the FAA clarify how to determine whether a radio altimeter (for example, LRA-900 P/N 822-0334-004) corresponds to a radio altimeter tolerant airplane or non-radio altimeter tolerant airplane. An individual requested the FAA revise the AD to add the list of the part numbers for compliant radio altimeters (e.g. Collins LRA-900+ and THALES ERT-530R).

FAA response: The FAA does not maintain a list of tolerant radio altimeters because the determination of a radio altimeter tolerant airplane must consider the installation details, which vary from airplane to airplane. The FAA has developed a policy statement that provides a means of compliance with this AD for all transport and commuter category airplanes and rotorcraft equipped with a radio altimeter. The FAA requested public comments on this proposed policy on May 8, 2023 (88 FR 29554). The proposed policy describes an acceptable framework and method for demonstrating that an airplane or rotorcraft is radio altimeter tolerant. The policy discusses compliance methods that should be applied to programs for type certificates, amended type certificates, STCs, and amended STCs. The proposed policy addresses how to assess 5G C-Band tolerance. Although most data submitted to demonstrate compliance in accordance with the FAA policy statement will be proposed by design approval holders, any person/entity can propose a method to demonstrate compliance.

Request to Clarify Restrictions at Non-CMAs

Comment summary: All Nippon and an individual requested the FAA clarify why the proposed AD would prohibit radio altimeter tolerant airplanes from landing at non-5G CMAs after July 2023. All Nippon stated that there are many non-5G CMAs that are unaffected by 5G C-Band interference and operations should not be restricted at such airports.

FAA response: The FAA disagrees. Boeing has not submitted any substantiating data that demonstrates the hazards addressed by this AD are adequately mitigated for radio altimeter tolerant airplanes at non-5G CMAs.

Conclusion

The FAA reviewed the relevant data, considered any comments received, and determined that air safety requires adopting this AD as proposed. Accordingly, the FAA

is issuing this AD to address the unsafe condition on these products. This AD is adopted as proposed in the NPRM.

Interim Action

The FAA considers this AD to be an interim action. Once the Technical Standard Order (TSO) standard for radio altimeters is established, which will follow the existing international technical consensus on the establishment of the minimum operational performance standards (MOPS), the FAA anticipates that the MOPS will be incorporated into the TSO. Once a new radio altimeter TSO is developed, approved, and available, the FAA might consider additional rulemaking.

Effective Date

Section 553(d) of the Administrative Procedure Act (APA) (5 U.S.C. 551 *et seq.*) requires publication of a rule not less than 30 days before its effective date. However, section 553(d) authorizes agencies to make rules effective in less than 30 days when the agency finds “good cause.” Radio altimeters cannot be relied upon to perform their intended function if they experience interference from wireless broadband operations in the 5G C-Band. This interference may affect other airplane systems using radio altimeter data, including the pitch control laws, including those that provide tail strike protection, regardless of the approach type or weather, which, in combination with multiple flight deck effects, could lead to loss of continued safe flight and landing. To address this unsafe condition, the actions required by this AD must be accomplished before the compliance date of June 30, 2023. The FAA based this date on the changes to the 5G C-Band environment beginning on July 1, 2023. These changes include increased wireless broadband deployment and transmissions closer to the parameters authorized by the FCC. The earlier operators learn of the requirements in this AD, the earlier they can take action to ensure compliance. An effective date less than 30 days would ensure the AD is codified earlier, thereby increasing awareness of its requirements. Therefore, the FAA

finds that good cause exists pursuant to 5 U.S.C. 553(d) for making this amendment immediately effective.

Costs of Compliance

The cost information below describes the costs to change the AFM. Although this AD largely maintains the AFM limitations currently required by AD 2022-03-05, the FAA acknowledges that this AD may also impose costs on some aircraft operators from having to change their conduct to comply with the amended AFM. However, the FAA lacks the data necessary to quantify the costs associated with aircraft operators changing their conduct.

The FAA estimates that this AD affects 347 airplanes of U.S. registry. The FAA estimates the following costs to comply with this AD:

Estimated costs

Action	Labor cost	Parts cost	Cost per product	Cost on U.S. operators
AFM revision (retained action from AD 2022-03-05)	1 work-hour X \$85 per hour ¹ = \$85	\$0	\$85	\$29,495
New AFM revision (new required action)	1 work-hour X \$85 per hour = \$85	\$0	\$85	\$29,495 ²

Authority for this Rulemaking

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. Subtitle I, section 106, describes the authority of the FAA Administrator. Subtitle VII: Aviation Programs, describes in more detail the scope of the Agency's authority.

¹ The labor rate of \$85 per hour is the average wage rate for an aviation mechanic.

² The estimated cost for this revision would not constitute a significant economic impact (even for small entities) because \$85 is a minimal cost compared to the regular costs of maintaining and operating a Model 747-8F, 747-8, or 777 transport category airplane.

The FAA is issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701: General requirements. Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

Regulatory Findings

This AD will not have federalism implications under Executive Order 13132. This AD will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

For the reasons discussed above, I certify that this AD:

- (1) Is not a “significant regulatory action” under Executive Order 12866,
- (2) Will not affect intrastate aviation in Alaska, and
- (3) Will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

The Amendment

Accordingly, under the authority delegated to me by the Administrator, the FAA amends 14 CFR part 39 as follows:

PART 39 - AIRWORTHINESS DIRECTIVES

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

§ 39.13 [Amended]

2. The FAA amends § 39.13 by:

a. Removing Airworthiness Directive (AD) 2022-03-05, Amendment 39-21922 (87 FR 4150, January 27, 2022), and

b. Adding the following new AD:

2023-12-05 The Boeing Company: Amendment 39-22463; Docket

No. FAA-2023-0670; Project Identifier AD-2022-01427-T.

(a) Effective Date

This airworthiness directive (AD) is effective [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].

(b) Affected ADs

This AD replaces AD 2022-03-05, Amendment 39-21922 (87 FR 4150, January 27, 2022) (AD 2022-03-05).

(c) Applicability

This AD applies to all The Boeing Company airplanes identified in paragraphs (c)(1) and (2) of this AD, certificated in any category.

(1) Model 747-8F and 747-8 series airplanes.

(2) Model 777-200, -200LR, -300, -300ER, and 777F series airplanes.

(d) Subject

Air Transport Association (ATA) of America Code 34, Navigation.

(e) Unsafe Condition

This AD was prompted by a determination that radio altimeters cannot be relied upon to perform their intended function if they experience interference from wireless broadband operations in the 3.7-3.98 GHz frequency band (5G C-Band), and a determination that this interference may affect other airplane systems using radio altimeter data, including the pitch control laws, including those that provide tail strike

protection, regardless of the approach type or weather. The FAA is issuing this AD to address missing or erroneous radio altimeter data, which, in combination with multiple flight deck effects, could lead to loss of continued safe flight and landing.

(f) Compliance

Comply with this AD within the compliance times specified, unless already done.

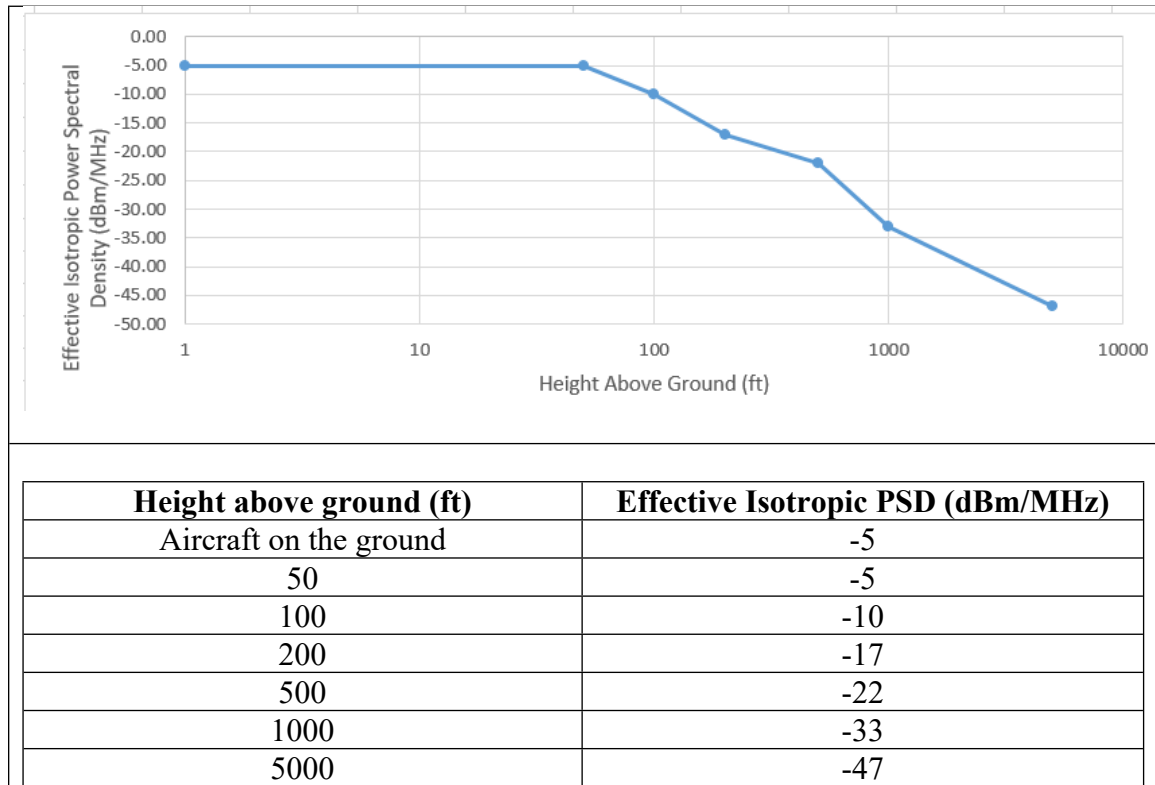
(g) Definitions

(1) For purposes of this AD, a “5G C-Band mitigated airport” (5G CMA) is an airport at which the telecommunications companies have agreed to voluntarily limit their 5G deployment at the request of the FAA, as identified by an FAA Domestic Notice.

(2) For purposes of this AD, a “radio altimeter tolerant airplane” is one for which the radio altimeter, as installed, demonstrates the tolerances specified in paragraphs (g)(2)(i) and (ii) of this AD, using a method approved by the FAA.

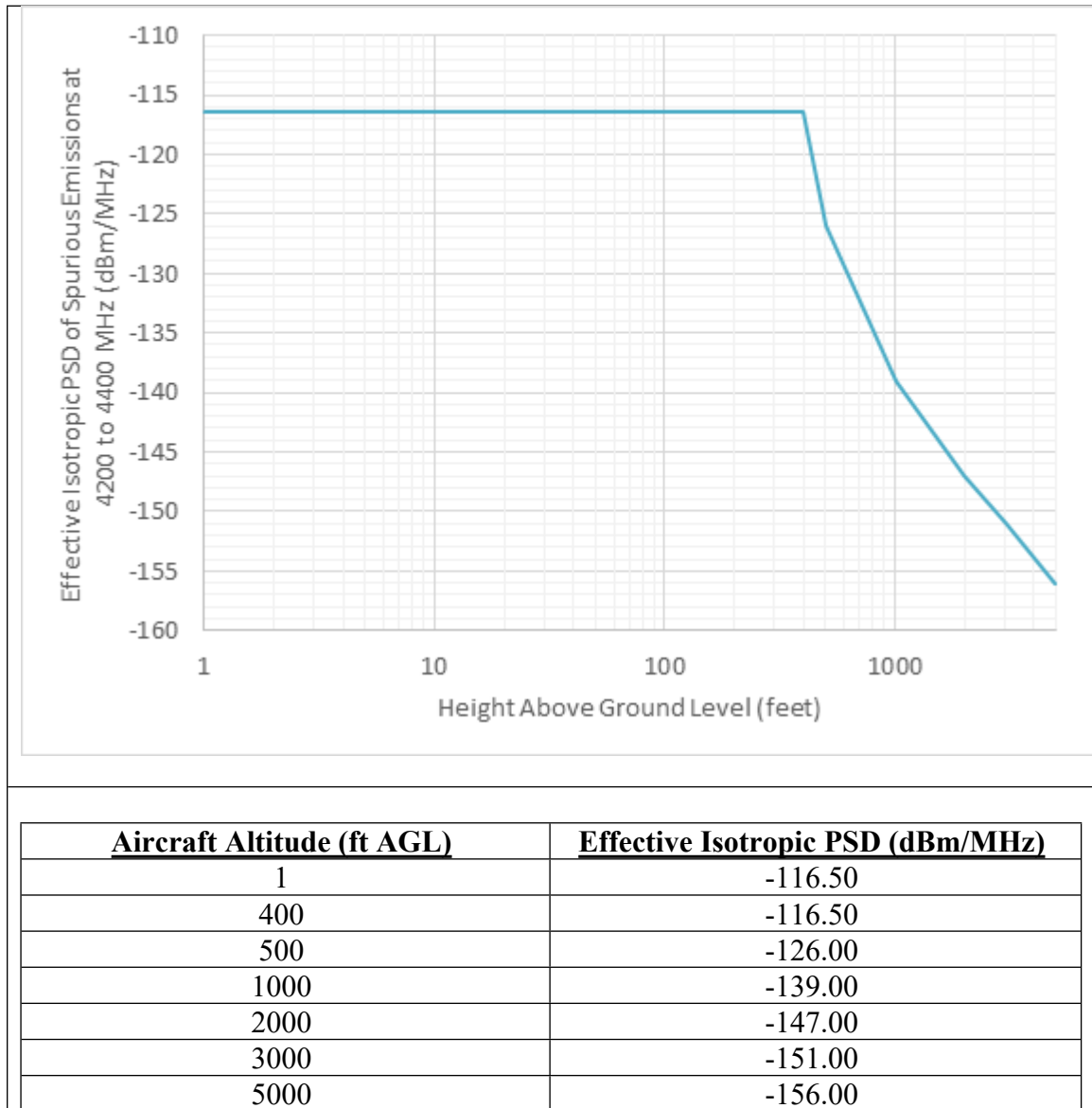
(i) Tolerance to radio altimeter interference, for the fundamental emissions (3.7-3.98 GHz), at or above the power spectral density (PSD) curve threshold specified in figure 1 to paragraph (g)(2)(i) of this AD.

Figure 1 to paragraph (g)(2)(i) – Fundamental Effective Isotropic PSD at Outside Interface of Aircraft Antenna



(ii) Tolerance to radio altimeter interference, for the spurious emissions (3.7-3.98 GHz), at or above the PSD curve threshold specified in figure 2 to paragraph (g)(2)(ii) of this AD

**Figure 2 to paragraph (g)(2)(ii) – Spurious Effective Isotropic PSD
at Outside Interface of Aircraft Antenna**



(3) For purposes of this AD, a “non-radio altimeter tolerant airplane” is one for which the radio altimeter, as installed, does not demonstrate the tolerances specified in paragraphs (g)(2)(i) and (ii) of this AD.

(h) Retained Airplane Flight Manual (AFM) Revision

This paragraph restates the requirements of paragraph (g) of AD 2022-03-05. Within 2 days after January 27, 2022 (the effective date of AD 2022-03-05): Revise the Limitations Section of the existing AFM to include the information specified in figure 3 to paragraph (h) of this AD. This may be done by inserting a copy of figure 3 to paragraph (h) of this AD into the existing AFM.

Figure 3 to paragraph (h) – AFM Limitations Revisions

(Required by AD 2022-03-05)

Approaches and Landings in the Presence of Radio Altimeter 5G C-Band Interference

Dispatching or releasing to airports, and approaches or landings on runways, in U.S. airspace in the presence of 5G C-Band wireless broadband interference as identified by NOTAM is prohibited (NOTAMs will be issued to state the specific airports or approaches where the radio altimeter is unreliable due to the presence of 5G C-Band wireless broadband interference).

(i) New Requirement: AFM Revision for Non-Radio Altimeter Tolerant Airplanes

For non-radio altimeter tolerant airplanes, do the actions specified in paragraphs (i)(1) and (2) of this AD.

(1) On or before June 30, 2023, revise the Limitations Section of the existing AFM to include the information specified in figure 4 to paragraph (i) of this AD. This may be done by inserting a copy of figure 4 to paragraph (i) of this AD into the existing AFM. Incorporating the AFM revision required by this paragraph terminates the AFM revision required by paragraph (h) of this AD.

(2) Before further flight after incorporating the limitations specified in figure 4 to paragraph (i) of this AD, remove the AFM revision required by paragraph (h) of this AD.

Figure 4 to paragraph (i) – AFM Revision for Non-Radio Altimeter Tolerant Airplanes

(Required by AD 2023-12-05)

Approaches and Landings in the Presence of Radio Altimeter 5G C-Band Interference

Due to the presence of 5G C-Band wireless broadband interference, dispatching or releasing to airports, and approaches or landings on runways, in the contiguous U.S. airspace is prohibited.

(j) New Requirement: AFM Revision for Radio Altimeter Tolerant Airplanes

For radio altimeter tolerant airplanes, do the actions specified in paragraphs (j)(1) and (2) of this AD.

(1) On or before June 30, 2023, revise the Limitations Section of the existing AFM to include the information specified in figure 5 to paragraph (j) of this AD. This may be done by inserting a copy of figure 5 to paragraph (j) of this AD into the existing

AFM. Incorporating the AFM revision required by this paragraph terminates the AFM revision required by paragraph (h) of this AD.

(2) Before further flight after incorporating the limitations specified in figure 5 to paragraph (j) of this AD, remove the AFM revision required by paragraph (h) of this AD.

Figure 5 to paragraph (j) – AFM Revision for Radio Altimeter Tolerant Airplanes

(Required by AD 2023-12-05)

Approaches and Landings in the Presence of Radio Altimeter 5G C-Band Interference

Due to the presence of 5G C-Band wireless broadband interference, dispatching or releasing to airports, and approaches or landings on runways, in the contiguous U.S. airspace is prohibited unless operating at a 5G C-Band mitigated airport as identified in an FAA *Domestic Notice*.

(k) Alternative Methods of Compliance (AMOCs)

(1) The Manager, Operational Safety Branch, FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14 CFR 39.19, send your request to your principal inspector or responsible Flight Standards Office, as appropriate. If sending information directly to the manager of the Operational Safety Branch, send it to the attention of the person identified in paragraph (l) of this AD. Information may be emailed to: AMOC@faa.gov.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the responsible Flight Standards Office.

(3) AMOCs approved for AD 2021-23-12, Amendment 39-21810 (86 FR 69984, December 9, 2021), providing relief for specific radio altimeter installations are approved as AMOCs for the requirements specified in paragraph (h) of this AD until June 30, 2023.

(l) Related Information

For more information about this AD, contact Brett Portwood, Continued Operational Safety Technical Advisor, COS Program Management Section, Operational

Safety Branch, FAA, 3960 Paramount Boulevard, Lakewood, CA 90712-4137; phone: 817-222-5390; email: operationalsafety@faa.gov.

(m) Material Incorporated by Reference

None.

Issued on June 9, 2023.

Michael Linegang, Acting Director,
Compliance & Airworthiness Division,
Aircraft Certification Service.

[FR Doc. 2023-13156 Filed: 6/16/2023 11:15 am; Publication Date: 6/21/2023]